Independent Oversight Review of the Hanford Site Waste Treatment and Immobilization Plant Project Construction Quality

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Office of Safety and Emergency Management Evaluations
Office of Enforcement and Oversight
Office of Health, Safety and Security
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Acronyms

AISC	American Institute of Steel Construction, Inc.
ASME	American Society of Mechanical Engineers
ASTM	ASTM International
BC	Black Cells
BNI	Bechtel National, Incorporated
CDR	Construction Deficiency Report
CM	Commercial Grade
DOE	U.S. Department of Energy
DOE-WTP	DOE-ORP Waste Treatment and Immobilization Plant Project Office
HLW	High-Level Waste Facility
HTR	Hard to Reach
LAB	Analytical Laboratory
LAW	Low-Activity Waste Facility
NCR	Non-conformance Report
NDE	Non-destructive Examination
NQA	Nuclear Quality Assurance
ORP	Office of River Protection
PIER	Project Issues Evaluation Report
PTF	Pre-treatment Facility
Q	Quality Related
QA	Quality Assurance
QC	Quality Control
SSC	Structures, Systems, and Components
WTP	Waste Treatment and Immobilization Plant

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1.0 PURPOSE

The U.S. Department of Energy (DOE) Office of Enforcement and Oversight (Independent Oversight), within the Office of Health, Safety and Security, conducted an independent review of selected aspects of construction quality at the Hanford Site Waste Treatment and Immobilization Plant (WTP). The review, which was performed November 14-17, 2011, was the latest in a series of ongoing quarterly assessments of construction quality performed by Independent Oversight at the WTP construction site.

2.0 BACKGROUND

The DOE Office of River Protection (ORP) was established in 1998 to manage the 53 million gallons of liquid or semi-solid radioactive and chemical waste stored in 177 underground tanks at the Hanford Site. ORP provides DOE line management of two functions: the Tank Farms, which maintain the 177 underground storage tanks; and the WTP, which is responsible for retrieval, treatment, and disposal of the waste stored in the underground tanks. The WTP is an industrial complex for separating and vitrifying radioactive and chemical waste stored in the underground tanks. The WTP complex consists of five major components: the Pre-treatment Facility (PTF) for separating the waste, the High-Level Waste (HLW) and Low-Activity Waste (LAW) facilities where the waste will be immobilized in glass, the Analytical Laboratory (LAB) for sample testing, and the balance-of-plant facilities that will house support functions. The WTP is currently in the design and construction phase. Design and construction activities at WTP are managed by Bechtel National, Incorporated (BNI) under contract to ORP. Construction oversight is provided by the ORP WTP Project Office (DOE-WTP) staff, specifically the DOE-WTP Construction Oversight and Assurance Division. Because of the safety significance of WTP facilities, Independent Oversight has scheduled quarterly reviews to assess the quality of ongoing construction.

3.0 SCOPE

The scope of this review encompassed various topics, including concrete placement activities, observation of welding inspections, and review of the inspection program for installation of piping, pipe supports, and tanks (vessels) in the black cells (BC) and hard-to-reach (HTR) areas. Independent Oversight examined a sample of non-conformance reports (NCRs) and construction deficiency reports (CDRs) identified by BNI under their corrective action program, as well as BNI's corrective actions to resolve structural steel bolting issues.

In addition, Independent Oversight reviewed various construction quality documents and conducted several construction site walkthroughs, concurrent with DOE-WTP staff. During the walkthroughs, Independent Oversight observed two concrete placements and various welding inspection activities. Independent Oversight also examined drawings, specifications, and procedures that control concrete placement activities; installation of piping, pipe supports, and mechanical equipment (tanks/vessels); and welding inspection activities.

4.0 RESULTS

Activities examined by Independent Oversight are discussed below. Each activity is briefly described, followed by a discussion of the review performed by Independent Oversight. Conclusions are summarized in Section 5, and opportunities for improvement are provided in Section 6.

Non-conformance Reports and Construction Deficiency Reports. NCRs are issued to document and disposition non-conforming conditions involving quality (Q) structures, systems, and components (SSC). Q components, previously designated QL, are constructed or manufactured in accordance with the WTP quality assurance (QA) program (ASME NQA-1). CDRs are issued to document and disposition non-conforming conditions for SSCs constructed on site by the contractor, BNI, as non-Q, commercial grade, or purchased from vendors as commercial (CM) items. CM components are purchased from vendors who are qualified as commercial grade suppliers but whose QA programs do not comply with ASME NQA-1. Evaluation for listing as a CM supplier requires assessment of the vendor's QA program against selected QA criteria designated by Engineering. Independent Oversight reviewed the 66 NCRs issued by BNI from September 21 through November 16, 2011, and approximately 77 CDRs issued by BNI between September 20 and November 16, 2011, to determine the types of non-conforming issues that were identified and subsequent mechanisms for resolution.

Approximately two-thirds of the NCRs and CDRs were issued to resolve equipment and hardware procurement problems, such as: (1) hardware/components that were delivered to the site without the required supporting documentation demonstrating compliance with purchase specifications, (2) hardware/equipment that did not comply with project specification requirements, (3) improperly labeled hardware, and (4) missing parts or damage that occurred during transit. Independent Oversight found that the BNI Engineering organization developed appropriate corrective actions to disposition the identified problems. Corrective actions usually involved rework performed on site, but in some cases the hardware was returned to the vendor. The NCR/CDR process and implementation were adequate to address and resolve procurement and construction quality deficiencies.

DOE-WTP Welding Inspection Program. The DOE-WTP staff performs independent inspections of one or more inspection attributes for approximately 5 percent of quality-related welds and is currently reviewing 100 percent of the weld records. DOE-WTP randomly selects the welds they examine. In addition to randomly selected welds, DOE-WTP places hold points on weld inspection documentation to provide a placeholder for DOE-WTP weld inspections. Hold points are identified by DOE-WTP to ensure a variety of welds are reviewed across all facilities. Welds selected by DOE-WTP for inspection include structural steel, piping, pipe supports, vessel (tank) welds, and weld repairs. Most of the welds examined by DOE-WTP are Q, but the DOE-WTP staff also includes some CM welds in their independent inspection sample.

Independent Oversight observed welding inspections performed by the DOE-WTP staff. The welds and attributes inspected were the final visual inspection of pipe joint weld numbers 24590-HLW-FWCL-11-00352 and 24590-HLW-FWCL-11-00432, and the visual fit-up and final visual inspection of pipe joint weld number 24590-HLW-FWCL-11-00393. These welds were pre-selected by DOE-WTP as DOE inspection witness points, which are designated as hold points on the field weld checklists. DOE-WTP also reviewed field welding checklists, drawings, specifications, and procedures associated with welds. Independent Oversight re-examined these welds and the associated documents and concurred with DOE-WTP that the welds were completed in accordance with project requirements.

Concrete Placement Activities. Independent Oversight observed portions of two concrete placements: (1) an interior wall, number 4141A, Elevation 41'-10" to 56'- 0", in the HLW building along Column Line R-2 from Column Line 12 to 7'-6" east of Column Line 15; and (2) LAW placement number 160B, a slab

for support of the LAW melter condenser stairs. Due to the potential exposure to freeze/thaw conditions, the concrete mix for the slab is designed with an entrained air content of 6%. Activities observed were quality control (QC) testing of fresh concrete for entrained air (for the LAW slab placement), slump, temperature, and unit weight; review of concrete batch tickets by QC inspection personnel; placement of the concrete in the forms; and consolidation of the concrete.

Independent Oversight reviewed the concrete pour cards and verified that they were signed to document that all required construction work and inspections were completed before concrete placement began. The concrete was tested in accordance with ASTM International (ASTM) standards specified in the project procedures. Samples of concrete for the LAW slab placement were obtained from the end of the pump line as required by specifications and industry standards for testing of concrete with entrained air. Test results showed that the delivered concrete met project requirements for entrained air, slump, and temperature. Concrete was sampled for molding of cylinders for unconfined compression testing. Review of the concrete batch tickets indicated that the proper concrete was delivered.

Preparations were made for cold weather concrete placement and for protection of the concrete during curing in accordance with American Concrete Institute recommendations and specification requirements. The temperature of the concrete forms, rebar, and embedded items was measured by QC inspectors and verified to be above the minimum temperatures listed in the specification prior to concrete placement during cold weather. Concrete forms were secure and cleaned (debris removed) before concrete placement began. Equipment to deliver the concrete to the forms was suitable. A sufficient number of vibrators were used for consolidating the concrete, and the vibrator operators, other construction craftsmen, and QC inspectors had sufficient access to the placement. Concrete drop distances were within specification requirements, vibrators were properly used, and excess water did not accumulate in the forms during placement. Independent Oversight observed concrete placement inspections performed by BNI inspectors and found those inspections to be adequately performed.

Based on recent operating experience highlighted in Nuclear Regulatory Commission Information Notice 2011-20, Concrete Degradation by Alkali-Silica Reaction, Independent Oversight reviewed the test results for the concrete constituent materials conducted in accordance with ASTM C-1567-04, Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method), documented in a letter dated March 31, 2008, from Construction Technologies Laboratory, Skokie, Illinois. The test results showed that the potential alkali-silica reactivity of the locally obtained coarse concrete aggregates will be mitigated by substituting 20-25 percent of the cementitious materials in the concrete mixes with Type F fly ash. The concrete mixes developed by the batch plant contractor, Central Premix, for the WTP project were designed using 20-25 percent fly ash. During review of the concrete batch tickets, Independent Oversight verified that the delivered concrete contained the appropriate type and percentage of fly ash (e.g., 22.5% for Mix No. F-7 placed in the HLW wall).

Inspection Program for Piping, Pipe Supports, and Mechanical Equipment in BC and HTR Areas. Project areas identified as BC will be inaccessible after plant startup due to high radiation. BCs are shielded rooms for which no maintenance or entry is planned for the 40-year design life of the plant. HTR areas are designated because of their location and the difficulty of performing maintenance or repairs. Approximately 25 percent of the piping and vessels (tanks) in the BC and HTR areas are classified as CM, while the remaining piping and vessels are Q. Components are classified Q if they are required to mitigate an accident or if failure of the component could result in a potential release to the environment. There are no valves in the BC areas, and the valves in the HTR areas are accessible from outside the HTRs.

The piping and vessels in the BC and HTR areas are of all-welded construction. Visual inspection is required for all piping, pipe support, and vessel welds in these areas, and other nondestructive examination (NDE) inspections are performed on piping and vessel welds (radiographic examination, ultrasonic examination, or liquid penetrant examination, depending on weld type). All manufacturer-produced longitudinal seam welds on piping installed in BC and HTR areas are required to be examined using either radiographic or ultrasonic techniques. The NDE requirements are summarized in Table 7 of Engineering Specification 24590-WTP-3PS-PS02-T0003, Field Fabrication and Installation of Piping.

Quality verification is performed to verify the quality of construction by monitoring, witnessing, inspection, or testing, or by using a combination of these activities. Quality verification of welds completed on site, called field welds, is performed by field welding engineers for all CM piping, pipe support, and vessel field welds, and QC inspection personnel perform inspections of field welds for Q piping, pipe supports, and vessels. During the quarterly review in September 2011, Independent Oversight reviewed the qualification and certification of field welding engineers and QC inspectors who perform NDE of welds in the PTF BC and HTR areas and verified that their levels of qualification, duties, and responsibilities met the recommendations of American Society for Nondestructive Testing Recommended Practice SNT-TC-1A, Personnel Qualification and Certification in Nondestructive Testing, as required by ASME NQA-1.

In addition to welding NDE inspections, numerous other quality verification activities are associated with installation of components in the BC and HTR areas. Independent Oversight reviewed the quality verification (inspection) requirements specified in construction procedures for installation of piping, pipe supports, and vessels and identified differences between inspection requirements for CM and Q components:

- Pipe Support Installation Quality Verification Inspection – Reference Construction Procedure 24590-WTP-GPP-CON-3509, Rev. 2A, Pipe Support Installation. For CM pipe supports, correct pipe support identification, location, installation, configuration, swing angle/offset, orientation, material, clearances, and check for damage are inspected by the field engineers only to verify design requirements. For Q pipe supports, field engineers perform initial inspections for each support to verify the above attributes and ensure that the Q pipe supports are installed in accordance with design requirements. After the field engineers complete their inspections, QC inspection personnel independently verify that the Q pipe supports comply with design requirements.

- Piping Installation Quality Verification Inspection – Reference Construction Procedure 24590-WTP-GPP-CON-3503, Rev. 5D, Aboveground Piping Installation. For both CM and Q piping, field engineers inspect and verify that material identification, traceability, configuration, dimensions, slope, surface defects, and pipe-to-equipment alignment comply with design requirements. After the field engineers complete their inspections for Q piping, QC inspection personnel independently verify that Q piping is installed in accordance with design requirements.

- Quality Verification Inspection for Pressure Testing of Piping – Reference Construction Procedure 24590-WTP-GPP-CON-3504, Rev. 7A, Pressure Testing of Piping, Tubing and Components. For CM piping, field engineers perform quality verification of pressure testing to ensure that design requirements are met. They also perform in-progress monitoring of CM piping installation, verify pressure test limits, witness testing, perform leak inspections, and perform post-pressure-test system walkdowns. For Q piping, field engineers and QC inspection personnel, independently or jointly, perform in-progress monitoring of the Q piping installation, verify pressure test limits, witness testing, perform leak inspections, and perform post-pressure-test system walkdowns.

- Tank/Vessel Quality Verification Inspections – Reference Construction Procedure 24590-WTP-MN-CON-3601, Rev. 2, Equipment Installation. For CM vessels, field engineers inspect the vessel foundation surface, vessel orientation, vessel internals, and cleanliness, as well as performing other inspections specified on the applicable inspection records to ensure that the vessel is installed in accordance with design requirements. Field engineers and QC inspection personnel perform these same inspections for Q vessels, but the QC inspectors' activities are independent of those performed by the field engineers.

The additional level of inspections provided by QC inspectors for Q piping, pipe supports, and vessels results in additional inspection points than is applied to CM components. Although failure of a CM component may not result in a release to the environment or impact nuclear safety, it could negatively affect the waste treatment process and the ability to operate the WTP efficiently, and replacing or repairing a CM component in a BC or HTR area will be extremely difficult, if not impossible, after hot commissioning. Currently, the reliability of CM components is addressed by redundancy of design consideration for BC and HTR areas. Document No. 24590-WTP-DB-ENG-01-001, Rev. 1Q, Basis of Design, Section 16, Black Cell and Hard to Reach Areas provides criteria (16.4.2.2) and 24590-WTP-SRD-ESH-01-001-02, Rev 5q, Safety Requirements Documents, section 2.0, provides criteria and for redundancy during design. Independent Oversight recommends that the current inspection program for CM components installed in BC or HTR areas be modified to include additional quality verification inspections for CM components, to provide additional assurance for the long-term reliability of the waste treatment process. (See Section 6, Opportunities for Improvement.)

Structural Steel Construction Activities. Most of the structural steel bolts used on the project are twist-off type tension control bolts with splined ends. Proper bolt tension is achieved when the splined end is severed from the bolt by the installation crew when the bolts are tightened.

During the September 2011 quarterly review, Independent Oversight observed construction workers pre-assembling structural steel members by using permanent bolts loosely installed in the bolt holes. The bolts will be tensioned when the members are installed in the structure. Approximately 250 beams had been pre-assembled using permanent bolts in the HLW building and the structural steel lay-down areas adjacent to the HLW. Most of the nuts were finger-tight on the bolts. However, in a large number of pre-assembled beams, the nuts were less than finger-tight and the mating surfaces of the steel members were not drawn together, so the portion of the bolt that will be tensioned is not protected from the elements. In some cases, the nuts were only loosely threaded on the bolts, leaving the threads where the nut would be seated upon tensioning exposed to the elements. This practice could result in deterioration of the lubricant on the bolt assembly prior to tensioning and contamination of the bolt threads with grit, allowing the spline to sever from the bolt before the bolt achieves its designed pre-tension value.

Pre-assembly of beams was discontinued after Independent Oversight questioned the practice. BNI issued Project Issues Evaluation Report (PIER) 24590-WTP-PIER-MGT-11-0866, Rev 0, Bolt up of A325 and A490 Structural Steel Connections, to document this condition and determine whether the method used to pre-assemble beams complied with American Institute of Steel Construction (AISC) 348. DOE-WTP issued an assessment follow-up item to document this issue and perform further review of compliance with AISC 348.

Three A325 bolts, 7/8" in diameter, were removed from two beams stored in the lay-down area adjacent to the HLW and tested by BNI on November 9, 2011. The test results showed these bolts were acceptable (i.e., the bolts achieved the designed pre-tension value before the spline severed from the bolt). However these tests were limited in scope. For example, no A490 bolts were included in the test sample, so a sample of A490 bolts will need to be tested if some of these pre-assembled beams contain A490 bolts

which have been exposed to the environment for an extended period of time prior to tensioning. An additional sample of A325 bolts in the remaining pre-assembled beams will also need to be tested if their final tensioning is further delayed. Consideration should be given to additional testing of twist-off type structural steel bolts that have been exposed to the environment prior to final tensioning. (See Section 6, Opportunities for Improvement.)

Follow-up on Structural Steel Installation Issues. In April 2010, BNI QC inspectors identified six structural steel bolts in the HLW that were not properly tensioned; that is, the six bolts still had the splined ends in place. NCR 24590-WTP-NCR-CON-10-0105 was issued on April 13, 2010, to document and disposition this problem. During a field inspection in November 2010 to determine the effectiveness of BNI corrective actions to resolve this problem, Independent Oversight and DOE-WTP identified two additional permanent bolts in one connection in the PTF that had not been tensioned (i.e., the splined ends were not severed). BNI issued NCR 24590-WTP-NCR-CON-10-0359 to document and disposition the two deficient PTF bolts, and DOE-WTP issued a finding for the improperly tensioned PTF bolts.

Corrective actions included BNI's re-inspection of all accessible bolts in connections in the PTF, HLW, LAW, and LAB facilities to verify that they were properly tensioned. The re-inspection program has been completed, and the results are documented in a report titled Walk Down for 24590-PIER-MGT-10-1220-B.

The report shows that the bolts on 12,700 connections were re-inspected to verify that they had been properly tensioned. The report states that a few non-tensioned bolts (splined end still in place) were identified on five connections, but these did not include all the bolts in the connection. The number of connections identified with improperly tensioned bolts was less than 0.04 percent of those inspected, and the number of improperly tensioned bolts was less than 0.01 percent of the total inspected. An additional 6200 connections were inaccessible, 2000 because access was restricted by other completed construction activities (although partial re-inspection of some bolts was possible), and 4200 because fire protection coatings had been applied.

Independent Oversight examined a number of connections with applied fire protection coatings and concluded that the coating was too thick to allow a determination of whether the spline had been severed from the bolts. The BNI report did not state the basis for not inspecting a sample of bolts in connections covered by fireproofing materials or those classified as inaccessible to verify that the splines were severed. (See Section 6, Opportunities for Improvement.)

Ongoing corrective actions to address structural steel construction issues will include monthly walkdowns by the BNI lead Civil QC engineer to observe and monitor construction quality, independent of activities performed by QC inspectors.

5.0 CONCLUSIONS

Independent Oversight determined that construction quality at WTP was adequate in the areas reviewed. BNI Engineering has developed appropriate corrective actions to disposition the NCRs and CDRs that were reviewed. Concrete placement and inspection activities are adequate, as are the independent weld inspections performed by DOE-WTP. However, CM components installed in BC and HTR areas are not subjected to the same number of quality control inspections as Q components. BNI has re-inspected the accessible connections to verify that twist-off type structural steel bolts were properly tensioned, but the corrective action documents do not state the technical justification for the decision not to re-inspect a sample of the bolts that are in connections coated with fireproofing or that are classified as inaccessible due to construction. The practice of pre-installing permanent structural steel bolts in connections but not

tensioning them for an extended period of time appears to conflict with the recommendations, precautions, and good industry practices documented in AISC 348. Although this practice was discontinued when it was questioned by Independent Oversight, additional non-tensioned twist-off type bolts may need to be tested to demonstrate that continued exposure to the environment does not prevent these bolts from reaching their pre-tension value prior to severing of the spline from the bolt.

While overall construction quality was adequate, Independent Oversight identified opportunities for improvement to address a few residual areas where issues have not been fully evaluated or documented.

6.0 OPPORTUNITIES FOR IMPROVEMENT

Independent Oversight identified the following opportunities for improvement. These recommendations are not intended to be mandatory. Rather, they are to be reviewed and evaluated by the responsible line management organizations and accepted, rejected, or modified as appropriate, in accordance with site-specific program objectives and priorities:

- Perform an evaluation of the inspection program for CM components installed in BC or HTR areas to consider additional quality verification inspections for CM components to provide additional assurance for long-term reliability of the waste treatment process, in addition to the current redundancy design standards
- Determine whether additional testing of twist-off type structural steel bolts that have been exposed to the environment prior to final tensioning is needed to demonstrate that the bolts will achieve the designed pre-tension value before the spline is severed from the bolt.
- Document the justification for not inspecting a sample of structural steel bolts covered by fireproofing materials or classified as inaccessible to verify that the bolts were properly tensioned (i.e., that the spline was severed from the bolt).

7.0 ITEMS FOR FOLLOW-UP

Independent Oversight will continue to follow up on the inspection of piping and pipe supports and the opportunities for improvement discussed above.

APPENDIX A
SUPPLEMENTAL INFORMATION

Review Dates

November 14-17, 2011

Independent Oversight Team Composition

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Documents Reviewed

- DOE-WTP Surveillance Reports for October 2011
- Construction Procedure 24590-WTP-GPP-CON-3203, Rev. 09D, Concrete Operations (Including Supply), November 24, 2010
- Construction Procedure 24590-WTP-GPP-CON-3206, Rev. 3E, Structural Steel Installation and On-Site Fabrication, November 29, 2010
- Construction Procedure 24590-WTP-GPP-CON-3503, Rev. 5D, Aboveground Piping Installation, August 11, 2011
- Construction Procedure 24590-WTP-GPP-CON-3509, Rev. 2A, Pipe Support Installation, September 29, 2011
- Specification No. 24590-WTP-3PS-D000-T0001, Rev. 7, Engineering Specification for Concrete Work, March 29, 2007

- Specification No. 24590-WTP-3PS-DB01-T0001, Rev. 8, Engineering Specification for Furnishing and Delivering Ready-Mix Concrete, March 26, 2007
- Specification No. 24590-WTP-3PS-SS00-T0001, Rev. 7, Engineering Specification for Welding of Structural Carbon Steel, January 30, 2008
- Specification No. 24590-WTP-3PS-PS02-T0003, Rev. 9, Engineering Specification for Field Fabrication and Installation of Piping, March 25, 2011
- Specification No. 24590-WTP-3PS-PH01-T0002, Rev. 6, Engineering Specification for Installation of Pipe Supports, July 13, 2011
- Specification No. 24590-WTP-3PS-SS02-T0001, Rev. 3, Engineering Specification for Erection of Structural Steel, December 1, 2008
- Construction Procedure 24590-WTP-GPP-CON-7106, Rev. 4A, Quality Control Personnel Certification, October 27, 2004
- Construction Procedure 24590-WTP-MN-CON-3601, Rev. 2, Equipment Installation, April 19, 2010
- Construction Procedure 24590-WTP-GPP-CON-01-001-10-22, Rev. 1, NDE Personnel Qualification and Certification NEPQ, June 23, 2009
- Specification No. 24590-WTP-3PS-M000-T0010, Rev. 4, Engineering Specification for Mechanical Equipment Installation Tolerances and Guidelines, May 16, 2010
- Construction Procedure 24590-WTP-GPP-CON-3504, Rev. 7A, Pressure Testing of Piping, Tubing and Components, April 5, 2011
- Specification No. 24590-WTP-3PS-P000-T0001, Rev. 6, Engineering Specification for Piping Material Classes General Description and Summary, June 20, 2008
- Document No. 24590-WTP-MN-CON-01-001-10-10, Rev. 6, Welding Control Manual, VT-AWS D1.1, Visual Examination Standard
- Document No. 24590-WTP- MN-CON-01-001-10-09, Rev. 7, Nondestructive Examination Standard Visual Examination VT-ASME
- Document No. 24590-WTP-DB-ENG-01-001, Rev. 1Q, Basis of Design, Section 16, Black Cell and Hard to Reach Areas
- Concrete Mix Design Data
- Project Issues Evaluation Report 24590-WTP-PIER-MGT-11-0866, Bolt up of A325 and A490 Structural Steel Connections
- Corrective actions for Nonconformance Report number 24590-WTP-NCR-10-0105, 6 TC bolts not fully tensioned for connection
- Corrective actions for Nonconformance Report number 24590-WTP-NCR-10-0359, 2 TC bolts in connection not fully tensioned
- Construction Deficiency Reports numbers 24590-WTP-CDF-CON-11-0393 through -0398; 24590-WTP-CDF-CON-11-0400 through -0431; 24590-WTP-CDF-CON-11-0433; and 24590-WTP-CDF-CON-11-0435 through -0463. Note: Numbers 24590-WTP-CDF-CON-11-0399, -0432, and -0434 were not issued.
- Nonconformance Report numbers 24590-WTP-NCR-CON-11-0288 through -0306; 24590-WTP-NCR-CON-11-0312 through -0345; and 24590-WTP-NCR-CON-11-0347 through -0356. Note: Numbers 24590-WTP-NCR-CON-11-0307 through -0311, and -0346 were not issued.